Use of Selective vs Standard Sheep Blood Agar for the Diagnosis of Hemolytic Streptococcus Group A Pharyngitis

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Pharyngitis is one of the most common complaints seen in the office of the family physician.[1] For the past 20 years, the medical literature has been replete with studies attempting to define the most practical methods of evaluating, diagnosing, and treating streptococcal pharyngitis. As physical findings are unreliable indicators in the diagnosis of streptococcal pharyngitis, throat cultures have become the mainstay in diagnosis.[2]

Recently several companies have begun marketing a selective growth medium to facilitate the diagnosis of β-hemolytic streptococcus group A by office-based primary care physicians. These kits, widely advertised to primary care physicians, are readily available through the mail for this purpose. The manufacturers have claimed that selective media have the inherent advantage of inhibiting all but streptococci, thereby facilitating the identification of these organisms.

The purpose of this study was to determine whether selective media used in a primary care physician's office could be accurately interpreted when compared with a reference laboratory utilizing standard sheep blood agar.

METHODS

From November 1982 through July 1983, all patients seen at the Tatem-Brown Family Practice Center on Monday through Thursday, who were clinically suspected of having streptococcal pharyngitis by either residents or family practice faculty, were entered into the study. Both children and adults were included.

All throat cultures were performed by the examining physician using the Culturette II dual swab collection system. The two Culturette swabs were then given to a nurse who separated them and used one to inoculate a selective media plate (Beta Kit). The swab was rolled over at least two thirds of the surface of the selective medium. A bacitracin disk was applied to facilitate the identification of group A colonies. The surface of the selective medium was stabbed to create partial environments of low oxygen tension to facilitate β hemolysis. Finally, a carbon dioxide pellet included with the kit was used as directed to create an environment rich in carbon dioxide. The second swab was retained in the collection system and sent to the hospital laboratory for normal processing. Both the selective media and standard sheep blood agar plates were coded so that the readers were unaware of the identity of the patient. Selective media were read as positive if even one colony with β-hemolytic streptococcus was found. As a quality control procedure, the selective media were handled in a standardized manner in accordance with the specifications provided by the manufacturer.

To measure physician accuracy in throat culture reading, all plates that were read in the reference laboratory were overread by the physician authors in a way so that the readers were blinded to the patient results on the office cultures. The physicians properly identified 92 percent of the positive cultures and 96 percent of the negative cultures.

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TABLE 1. STREPTOCOCCAL GROWTH ON REFERENCE CULTURE AS INTERPRETED BY LABORATORY COMPARED WITH STREPTOCOCCAL GROWTH ON SELECTIVE MEDIUM AS INTERPRETED BY PHYSICIANS

	Laboratory-Interpreted Reference Culture	
	Present	Absent
Physician-interpreted selective medium		
Present	16	12
Absent	18	143

Prevalence, 18 percent (using reference laboratory as gold standard); sensitivity, 47 percent; specificity, 92 percent; predictive value positive, 57 percent; and predictive value negative, 89 percent

RESULTS

The results of the study are summarized in Table 1. The sensitivity and specificity of the selective media were 47 and 92 percent, respectively. The predictive value for a positive culture using selective media was 57 percent. Using the Fisher's exact test,[3] the probability of obtaining false-positive and false-negative rates, respectively, with the selective medium (3.6 percent, 47 percent) and blood agar medium (3.8 percent, 8.6 percent) was statistically significant ($P < .044$).

DISCUSSION

A major difficulty with any study such as this is that office methods are being compared with "standard" throat culture methods in a hospital laboratory. It must be remembered that the standard throat culture technique is influenced by many variables, some of which include type of media, variation in patient population, location (office vs hospital vs research laboratory), type and size of incubator, anaerobic vs aerobic techniques, criteria used to determine a positive reading, experience of the reader, and location of media production.

In this study, there were 34 positive cultures as processed and interpreted by the hospital laboratory on standard sheep blood agar; however, only 18 of these were detected by the experienced physician readers utilizing the selective media in the office. Employing the hospital laboratory as the "gold standard," this represented a 47 percent false-negative rate. In other words, the false-negative rate was five times greater than that observed with the standard hospital processed media.

There are several potential reasons for this finding. First, the selective medium may not be as sensitive as advertised. Second, the small office incubator may not maintain a steady, favorable temperature. In an attempt to partially rule out this factor in the present study, the incubator was tested for temperature stability but only in a post hoc manner. Finally, the sensitivity of the selective medium may have decreased with time or temperature changes that often occur with mailing from the manufacturer. On the other hand, family physicians were able to interpret standard sheep blood agar processed in a hospital laboratory with a high degree of accuracy when compared with hospital laboratory technicians. It is unlikely, therefore, that lack of skill of the family physician readers was an important variable.

In conclusion, this study illustrates that in the family physician's office, this particular selective media had an unacceptably high false-negative rate (47 percent) when compared with standard blood agar read by trained hospital personnel. This finding cannot be generalized to all types of selective media, which vary in composition and quality. Perhaps the most important implication of the present study is that physicians must beware when introducing any new laboratory test into the office setting. In the present case, one possible preventive measure would be to test a small sample of each new shipment against a stock culture to ensure the integrity of the cultures. Likewise, collecting some split sample control data on a periodic basis would also be beneficial.

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References

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